91 Fossilized Footprints

INVESTIGATION

Paleontologists (pay-lee-uhn-TALL-uh-jists) are scientists who study fossils. Fossils are rarely complete and are often just a shell, half a leaf, or a couple of bones. In some cases, the only evidence left by an organism is its tracks. Footprints and other types of animal tracks can be fossilized in the same way as actual body parts. But what can you find out from just footprints? Like detectives, paleontologists can use the information from fossil footprints to determine how an organism moved, how fast it traveled, what type of environment it lived in, and what it might have been doing when its footprint was formed.

CHALLENGE

How can fossil footprints be used to study the behavior of animals that were alive millions of years ago?

MATERIALS

For each group of four students

- **1 set of 3 Fossil Footprint Cards**
- **1 metric ruler**

For each student

- **1 Student Sheet 91.1, "Footprint Analysis"**

Few fossil remains are as complete as this 10 million-year-old rhinoceros in Nebraska.

Evidence Comes in Steps

A fossil footprint site has just been discovered! You take a helicopter to the location in the hope that your expertise will be useful. The rest of the team is slowly brushing away layers of sediment to carefully uncover the footprints.

Your task is to use your observations to draw inferences and then develop a hypothesis about what happened to form the footprints. As the footprints are uncovered, there will be more evidence to examine. Remain open to new possibilities as the investigation continues.

PROCEDURE

Part A

1. Examine Fossil Footprint Card 1, which shows what the team has uncovered so far.
2. In your group, discuss what you think was happening while these footprints were being created. You do not have to agree, but:
   - If you disagree with others in your group about what happened, explain to the rest of the group why you disagree.
   - Listen to and consider other people's explanations and ideas.
3. Record your ideas in the first row of Student Sheet 91.1, "Footprint Analysis." Separate your ideas into observations and inferences. **Note:** Even though some of your inferences may conflict with other inferences, consider as many ideas as possible.
4. Time passes and more footprints are uncovered. Obtain Fossil Footprint Card 2.
5. Repeat Step 2. Then record your additional observations and inferences in the second row of Student Sheet 91.1. However, do not change what you wrote in the first row!
6. Time passes and a third section of footprints is uncovered. Obtain Fossil Footprint Card 3.
7. Repeat Step 2. Then record your additional observations and inferences in the third row of Student Sheet 91.1. Remember, do not change what you wrote in the first two rows!

8. Look back at all your observations and inferences. Try to think of the best possible explanation for how the footprints were formed. Record your strongest hypothesis in your science notebook. If you have two or more hypotheses in mind, record them all, but rank them from most likely to least likely.

9. Answer Analysis Questions 1 and 2.

Fossil footprints

Part B

10. Hypotheses change as scientists gather new data. The information in Table 1 below has just come in from the fossil site!

Table 1 Average Depths of Footprints (Scenario 1)

	Card 1	Card 2	Card 3
Larger footprints	6.0 cm	6.2 cm	8.3 cm
Smaller footprints	2.5 cm	2.6 cm	———

a. What hypotheses would the data in Table 1 support?

b. Explain how these data could provide more evidence in support of one or more hypotheses.

11. Instead of the data from Table 1, imagine you just received the data in Table 2 below.

Table 2 Average Depths of Footprints (Scenario 2)

	Card 1	Card 2	Card 3
Larger footprints	6.0 cm	6.2 cm	6.1 cm
Smaller footprints	2.5 cm	2.6 cm	———

a. What hypotheses would the data in Table 2 support?

b. Explain how these data could provide more evidence in support of one or more hypotheses.

c. What factor(s) might explain the difference in the depth of the footprints in the different scenarios?

ANALYSIS

1. Why is it important for scientists—and people in general—to distinguish between observations and inferences when they develop a hypothesis?

2. Imagine that the team uncovered a fourth section of footprints. Draw what you predict this fourth section might look like. Explain how it would provide more support for the hypothesis you favor.

3. a. Think back to an activity in which you came up with hypotheses based upon evidence, such as Activity 74, "Observing Organisms," in the Ecology unit. Describe an example of an observation and an inference based upon that observation and explain how the two are different.

b. Describe an example of an observation and an inference from a recent event in your everyday life.